

PATENT CLAIMS

1. A diamond electrode comprising synthetically produced, electrically conductive (doped) diamonds,
5 characterized in that it has diamond particles (5) embedded in the surface of a metal or metal alloy layer so as to produce a conductive connection to the metal or metal alloy.
- 10 2. The diamond electrode as claimed in claim 1, characterized in that the locations which are left between the diamond particles (5) at the surface of the electrode are provided with a nonconductive oxide layer (4) and are thereby passivated.
- 15 3. The diamond electrode as claimed in claim 2, characterized in that the nonconductive oxide layer (4) is covered with a sealing layer, for example a silicate layer.
- 20 4. The diamond electrode as claimed in one of claims 1 to 3, characterized in that the embedding layer (3) is applied to a layer of substrate material (2).
- 25 5. The diamond electrode as claimed in claim 4, characterized in that the layer of substrate material (2) consists of metals or metal alloys passivated by oxides, in particular of titanium, aluminum or of alloys of these metals.
- 30 6. The diamond electrode as claimed in claim 4, characterized in that the layer of substrate material (2) is insulated on its rear side.
- 35 7. The diamond electrode as claimed in claim 4, characterized in that the layer of substrate material (2) is provided on both sides with a diamond layer with embedded diamond particles.

8. The diamond electrode as claimed in one of claims 1 to 7, characterized in that the embedding layer (3) at least partially comprises elements which are able to form nonconductive oxides.

5

9. The diamond electrode as claimed in claim 8, characterized in that the embedding layer (3) contains at least one metal selected from the group consisting of magnesium, aluminum, titanium, yttrium, zirconium, hafnium, tantalum, vanadium and zinc.

10

10. The diamond electrode as claimed in one of claims 1 to 9, characterized in that the diamond particles (5) embedded in the surface of the embedding layer (3) are doped in particular with boron, phosphorus or nitrogen.

15

11. The diamond electrode as claimed in one of claims 1 to 10, characterized in that the grain size of the diamond particles (5) is between 1 and 700 μm , in particular up to 200 μm .

20

12. The diamond electrode as claimed as claimed in one of claims 1 to 11, characterized in that the grain size of the embedded diamond particles (5) substantially coincides.

25

13. A process for producing a diamond electrode, characterized in that a powder formed from doped, electrically conductive, synthetically produced diamonds is embedded at least in the surface of a metal or a metal alloy, in such a manner as to produce a conductive connection between the metal or metal alloy and the diamond particles (5).

30

14. The process as claimed in claim 13, characterized in that the doped diamond particles are introduced directly into a substrate material, which contains at least one element which is able to form a nonconductive oxide layer, by mechanical forces and/or the action of

35

temperature.

15. The process as claimed in claim 14, characterized
in that the doped diamond particles are pressed or
5 rolled into the surface of the substrate material.

16. The process as claimed in claim 14, characterized
in that the doped diamond particles are accelerated in
fluids and are thereby introduced into the surface when
10 they strike the latter.

17. The process as claimed in claim 13, characterized
in that the doped diamond particles are mixed with
powders of metals or metal alloys which are able to
15 form a nonconductive oxide layer and pressed, so that a
pressed part, if appropriate with support plate, is
formed, this pressed part containing the diamond
particles embedded in one or more layers.

20 18. The process as claimed in claim 13, characterized
in that the doped diamond particles are sintered onto a
substrate material.

19. The process as claimed in claim 13, characterized
25 in that the metals or metal alloys are deposited from
the vapor phase.

20. The process as claimed in claim 13, characterized
in that low-melting materials, for example magnesium or
30 a magnesium alloy, which are melted on an in particular
metallic substrate layer (2) with a higher melting
point, are used as starting material for the embedding
layer (3), the diamond powder already having been mixed
with the powder of the alloy or then being applied to
35 the still liquid metal and finally being cooled.

21. The process as claimed in claim 13, characterized
in that a metal or a metal alloy with diamond powder is
deposited by electroplating, with an aqueous solution

or a molten salt, in which the diamond powder is held suspension by stirring or the like and is thereby incorporated into the deposited metal, is used.

5 22. The use of the diamond electrode produced as described in at least one of claims 13 to 21 as starting product for further deposition of doped diamonds using conventional processes, in particular CVD and PVD processes.

10

23. The process as claimed in one of claims 13 to 21, characterized in that conductive metals or metal alloys, which at least partially comprise at least one element which is able to form nonconductive oxides,
15 such as magnesium, aluminum, titanium, yttrium, zirconium, hafnium, tantalum, vanadium or zinc are used for the embedding layer (3) and/or the substrate material.

20 24. The process as claimed in one of claims 13 to 21 or 23, characterized in that the metal surfaces or locations which remain clear between the diamond particles (5) are passivated.

25 25. The process as claimed in claim 24, characterized in that an oxide layer is produced by means of anodic or chemical oxidation for passivation purposes.

26. The process as claimed in claim 25, characterized
30 in that the anodic oxidation is carried out by direct current, pulsed direct current or alternating current with the anodic phase period dominating.

27. The process as claimed in claim 25 or 26,
35 characterized in that in particular aqueous solutions which contain borate, sulfate, phosphate and fluoride ions in combination are used to carry out the anodic oxidation.

28. The process as claimed in one of claims 24 to 27, characterized in that the oxidation solutions are buffered.

5 29. The process as claimed in one of claims 24 to 28, characterized in that the oxide layer is sealed.

30. The process as claimed in claim 29, characterized in that the oxide layer is subsequently treated with an aqueous silicate which is hardened under air rich in carbon dioxide.

31. The process as claimed in claim 29, characterized in that the surface is transformed by the penetration of dissolved metal salts, with or without applied potential, into a layer having properties of a technical-grade ceramic, such as cordierite or sintered corundum.

32. The process as claimed in claim 13, characterized in that the doped conductive diamond particles are introduced into the surface of coated substrate materials, in particular coated with Teflon.

33. The use of diamond electrodes produced using the process as claimed in claim 32 for the production of gases, in particular of ozone and/or oxygen.

34. The process as claimed in one of claims 13 to 21 and 23 to 32, characterized in that the particles of the diamond powder have a grain size of from 1 to 700 μm , in particular of up to 200 μm .

35. The process as claimed in one of claims 13 to 21 and 23 to 32 and 34, characterized in that the particles of the diamond powder are doped with boron, phosphorus or nitrogen.

36. The process as claimed in one of claims 13 to 21

and 23 to 32 and 34 or 35, characterized in that the particles of the diamond powder have at least substantially coinciding grain sizes.